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ABSTRACT

This project started as a pilot study that examined and evaluated a single course that was delivered during the 1999-2000 academic year in a traditional lecture-based section, as well as in a telecourse section and a Web-based section. The hypothesis of the study was that there was no significant difference between the three courses in terms of performance as measured by overall final course grade, and attitude as measured by survey response. After the pilot year, the research was expanded to include all distance courses offered during the 2000-2001 academic year, but only in order to compare attrition rates and overall class grade point averages (GPAs). Students enrolled in Math 155 (Introduction to Statistics) at Lakeland Community College (LCC) (Ohio) in 1999-2000 and who completed the pre-test and the final exam were studied. The 78 students were 41% male, 59% female, and 40% traditional age, 60% non-traditional age. Research question one explored whether there would be a significant difference in student achievement, with regard to the instructional delivery method, as measured by overall final course grade. The results indicated no significant difference, and that there was no harm to the learner in institutions using alternative instructional delivery systems. The study asked a total of five research questions.)(Contains 74 references.) (NB)

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Online and in the Classroom:
The Numbers and What They M*ight* Mean

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A Presentation to the

League for Innovation in the Community College

Innovations Conference

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March 19, 2002

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Abstract

This presentation examines Lakeland Community College's yearlong research on the impact all web-based course offerings had on students learning compared to equivalent classroom-based offerings. This session will benefit institutions that are planning assessment strategies for their distance programs. Participants can use this research to define their roles in the student learning process. The presenter will share data and all models of assessment tools as well as future assessment focused on learning measurement and faculty development.

Introduction

There continues to be a tremendous growth in distance learning programs offered by colleges and universities. This affords the growing cohort of adult learners access to educational opportunities. The National Center for Educational Statistics reported "that in December 1999, 44% of higher educational institutions in the U.S. offered distance education courses." (Short, 2000, p. 56). While telecourses have provided a reliable source of instruction to date, the growth in web-based course offerings has seen an amazing "38% increase from 1995 to 1999 in the number of institutions using computer technology to deliver courses to students" (Short, 2000, p. 56).

Using technology to reach students unable to attend classes is a solution colleges and universities are evaluating and implementing. Increasing enrollment and reducing the cost of instruction is a goal many educators believe technology-based systems will deliver. These systems will allow institutions to be competitive in the future yet these technology-based systems are "challenging the primary assumption of the current instructional model: that the only way to achieve effective student learning is for faculty members to meet with groups of students at regularly scheduled times and places." (Twigg, 2000a, p. 42).

This research took place at a community college and studies have shown that two-year colleges "have been active and taken a leadership position in the development and delivery of courses for distance education." (Easterday, 1997, p. 33). Distance education programs have used a wide variety of media to reach and serve the remote or distant student from the development of correspondence courses in the late 19th century (Thomerson & Smith, 1996) to video-based programs such as telecourses (Willett, 1986) and now include web-based instruction (Ridley & Sammour, 1996). "Distance education programs have been shown to be effective in meeting the educational needs of rural and non-traditional students, who often are geographically separated from a college or university" (Thomerson & Smith, 1996, p. 47). This research examined the possible impact technology-based delivery systems have on a student's learning experience compared to a classroom-based instructional learning experience.

The interactive learning process encourages the implementation of collaboration tools that technology can provide, "technology is essential in order for institutions to provide quality education at a distance for the increasing numbers of nontraditional students." (Pinheiro, 1998, p. 129). It is the growth of learning opportunities available to all students of all ages that spurs the use of varied technology tools used for cooperative learning in order to "prepare them for the technology-driven, team-oriented workplace of tomorrow." (Chrisman, 1998, p. 82).

Project Overview

This research started as a pilot study during the 1999 - 2000 academic year that examined and evaluated a single course of study that was delivered in a traditional lecture-based section, telecourse section, and web-based section. The hypothesis of this research was that there was no significant difference between the classroom-based lecture, video-based telecourse, or the online, web-based course in terms of performance as measured by overall final course grade and attitude as measured by survey response. Consideration was given to the feedback obtained from the student and then analyzed statistically in order to provide insight into areas that can be modified and improved upon (Cortada, 1998, p. 251).

After the first pilot year the research was expanded to include all distance courses offered during the 2000 - 2001 academic year but to only compare attrition rates and overall class GPA's to their classroom equivalent. Information from the National Center for Education Statistics identified that two of the top three instructional delivery systems include asynchronous web-based courses and one-way, pre-recorded video programs, known as telecourses, being ranked one and three with two-way, interactive video classes being ranked second (Boettcher, 2000, p. 40).

The results gathered indicated no significant difference between the delivery methods, allowing "us to employ cheaper and simpler technologies with assurance that outcomes will be comparable with the more sophisticated and expensive ones as well as conventional teaching/learning methods." (Russell, 1999, p. xiii). The pilot study yielded additional data from the perspective of the student learning experience. Student attitudes are a vital criterion assisting institutional leadership in determining the effectiveness of a distance education program, "a criterion that is arguably as important as the most-often cited outcome measurement in the current literature, student achievement." (Biner & Dean, 1995, p. 10). Student attitude and achievement are vital but institutions also want to know who the student is and how the institution can attract students to their program offerings. The pilot study also analyzed if gender and age impacted the effectiveness of instructional delivery systems.

Relevance and Significance

Higher education is observing the rapid growth of distance learning not only as a "supplement to traditional institutions and programs, but also as a replacement for those institutions and programs. Further, distance learning is seen by many as a transformative vehicle for increasing the pace of change and reform in higher education." (Phipps, Wellman & Merisotis, 1998, p. 1). Institutions are looking to the future and to their own growth and survival as well. "Ten years from now, more than 25 million people will be registered for post-secondary learning experiences in the United States alone" (Twigg, 1999, p. 13). Many of these future students will look to learning options in their community because "they will be seeking updated skills and knowledge to obtain better jobs or to perform more effectively in their current positions." (Twigg, 1999, 13-14). A report prepared for the Council for Higher Education Accreditation supports the efforts of distance learning providers to make instruction learner-centered which is defined by three basic qualities, that "instruction is largely self-directed; it is more focused and purposeful; and it employs the appropriate level of faculty mediation." (Phipps, Wellman & Merisotis, 1998, p. 1). Learner-centered systems speak of using technology effectively (O'Banion, 1997) in order to create an environment where students can "gain access to information, to interpret it, to give it context, to use information to solve problems, and to collaborate with others in problem solution." (Doucette, 1994, p. 23).

The review of literature identified that distance learning in a community college setting, especially telecourses, "accommodates nontraditional learners and students living in rural settings, primarily employing low-end technology in its outreach service." (Swienciki, 1996, p. 179). In a study conducted at Calhoun Community College, it was found that there was no significant difference in grade distribu-

tion between telecourse students and traditional classroom students (Searcy, Howton & Yarbrough, 1993) which supported similar research comparing telecourse and classroom students conducted by Chu and Schramm (1979) and Wilkinson (1980). Another study came to the conclusion that "on-line students' performance was quite comparable to, and in some cases excelled, that of their classroom counterpart." (Ridley & Sammour, 1996, p. 338). Online instructors at Christopher Newport University "rated student performance and learning in the areas related to general skills development significantly higher in online than in classroom courses." (Ridley & Sammour, 1996, p. 338). A study conducted at Christopher Newport University found that web-based course offerings impacted the institution's full time enrollment (FTE) confirming "that net FTE gain can accrue even when students overwhelmingly commute from inside the traditional service area." (Ridley, Bailey, Davies, Hash & Varner, 1997, p. 16).

Telecourse programming, often delivered via public television stations or cable television systems, has coexisted with traditional lecture-based offerings since the early 1980s in many institutions. A question being raised in response to this challenge is whether to continue the investment in cable television technologies used in delivering telecourses or invest in web-based delivery systems. Telecourses offered via cable are very cost-effective since these "programs can be viewed by an unlimited number of people within a broadcast area without affecting the delivery cost." (Marquardt & Kearsley, 1999, p. 88). This technology is very stable and many "educators view the telecourse-delivery system as a way of reaching new groups of potential students. Others see the telecourse delivery system as a college-entry option for students who are intimidated by traditional classroom instructional experiences." (Willett, 1986, p. 33). Another viewpoint identified by Brown (1988) is that "All things being equal, face-to-face interaction is the preferred learning mode for most people. Television viewing represents passive learning and participants' cognitive engagement appears to wane over extended periods of viewing time" (p. 9).

Technology is challenging institutions to be effective in new and different ways as well. New facilities are being defined in terms of cable backbone and infrastructure support systems instead of bricks and mortar (Flynn, 2000) although "at their core all the institutions look pretty much alike (i.e., a credit-for-contact system of classroom-bound lecture, discussion, and print-oriented instruction)" (Munitz, 2000, p. 15). "Higher education has begun to recognize the profound implications of the merger of telecommunications technology with computer technology." (Langenberg, 1999, p. 16) and the desire to increase student enrollment is moving academic institutions into the evolving world of web-based education (Arenson, 1998). Instructional teams are creating and delivering content using web-based tools. A course delivered via the Internet has shown to be cost effective (Phillips, 1998; Thatch & Murphy, 1995) and provides options that make it an attractive teaching tool as well. "Well-designed and properly implemented, computer-assisted, independent learning systems are effective in increasing student learning at acceptable costs" (Doucette, 1994, p. 22). However, costs must be factored into alternate delivery systems since instruction delivered traditionally, such as a lecture in a classroom, initially has a lower cost than instruction designed and delivered using technology (Ryan, 1997).

Institutions of higher education, especially community colleges, are offering distance education programs to meet growing expectations and requests from the communities in which they operate. Research from the International Data Corporation (IDC) (1999) supports this expectation stating that by "2002, 85% of two-year colleges will be offering distance-learning course, up from 58% in 1998." (p. 1). In addition, the IDC (1999) states that the "number of college students enrolled in distance-learning courses will reach 2.2 million in 2002, up from 710,000 in 1998." (p. 1). This growth is not surprising since many demographic measures indicate that higher education will be one of the growth industries for several decades. One reason given for this is that the traditional "age cohort is expanding (perhaps adding as many as two million students over the next decade, but even more important, older and employed learners will add more than twenty million students to the enrollment pool." (Munitz, 2000, p. 14). This increase in the enrollment pool may stretch the traditional institution's facilities and faculty. Looking to the future, an institution will not reduce traditional on-campus programs to meet the demand. Instead, they will expand their market using alternative delivery systems to reach outside of their traditional geographic service area. These technology-based delivery systems, especially the Internet, will "fundamentally alter how colleges and universities conduct the business of higher education, how professors teach, and how students learn." (Clague, 1999, p. 45). It has been observed that community college students are becoming more accustomed to tools and

services that provide access to information and they expect these systems to be a part of their educational experiences (Milliron & Miles, 1998, p. 23).

Non-traditional students have often been the normal audience for distance learning efforts (Roberts, 1996) although "motivated students learn not from the medium or system used, but in spite of it" (Wilkes & Burnham, 1991, p. 43). Some distance learning demographic research indicates that "the independent study population has shifted towards younger students, local residence, and full-time course loads that combine independent study with on-campus courses." (Wallace, 1996, p. 1). This younger age group takes the Internet for granted and "are not content to assimilate information passively but are used to interacting with it, responding to it, and giving it new shape and meaning." (Munitz, 2000, p. 17). This younger, traditional college-age group may take the Internet for granted, but overall student demographics indicate that "the majority of American college and university students will be older than 25.... They are working adults, parents, serious (if part-time) students, and citizens who actually vote." (Langenberg, 1999, p. 16). While the Internet is mentioned, one study described the "successful telecourse student as being over 25 years-old and married (Dille & Mezack, 1991) and female (Oxford et al., 1993)." (Bink, Biner, Huffman, Geer & Dean, 1995, p. 15). This data is further supported by studies conducted at Howard Community College in Columbia, MD. It indicated gender may also be a key factor in choosing a distance learning option and found that "80.2% of the telecourse students" (Easterday, 1997, p. 33) were female.

Higher education must provide distance students with services, support, and learning opportunities that fit their life style and work needs while addressing issues that impede their academic success. "Technology should be used to provide the tools to create this student-centered environment, but delivery processes and philosophies will also be transformed to leverage technology and fully implement new service models." (Beede & Burnett, 1998, p. 71). There have been published principles and guidelines regarding the development of technology-based education and training, notably Alessi and Trollip (1991), Floyd (1991), Science Applications International Corporation (1992), and Reynolds and Araya (1995), which all had a common base of instructional system design as described by Dick and Carey (1985). To create an environment where learning and productivity can be combined and optimized, technology must be utilized (Marquardt & Kearsley, 1999) and incorporated into the collaborative learning experience. "The real value of collaborative learning emerges when the professor, instead of treating it simply as an adjunct to the class, integrates the concept into the pedagogy of the course." (Pinheiro, 1998, p. 121).

In a effort to focus on the development pedagogy, delivery processes, and the creation of the student-centered environment identified for student success, a study was recently commissioned by the National Education Association, a professional association for faculty in higher education, and Blackboard, Inc., a provider of web-based course development tools. Together they commissioned the Institute for Higher Education Policy to examine, validate and redefine the principles and guidelines with specific attention to Internet-based distance education. This study included a comprehensive institution, a virtual institution, a research institution, and a community college. This study resulted in twenty-four essential benchmarks for quality distance education programs especially ones that are Internet-based. One interesting point is that these benchmarks are very similar to the requirements described in the Guidelines for Distance Education, Appendix L, written by the North Central Association (NCA) of Colleges and Schools and whose final draft the Commission on Institutions of Higher Education approved in January 1998. This accrediting organization reflects the changes in how distance education students are being viewed by the various governing bodies.

A report prepared for the Council for Higher Education Accreditation supports the efforts of distance education providers to make instruction learner-centered which is defined by three basic qualities, "instruction is largely self-directed; it is more focused and purposeful; and it employs the appropriate level of faculty mediation." (Phipps, Wellman & Merisotis, 1998, p. 1). A recent study raises the question of what type and level of faculty contact is appropriate. Ruth and Bill Maki teach psychology at Texas Tech University in Lubbock, TX. For the last two and a half years they have offered a web-based and a traditional version of an introduction to psychology course. While the web-based students "have

consistently scored an average of five percentage points higher on the final exam.... [they have] just as consistently...reported they are less satisfied with the course" (Carr, 2000, p. 1).

A group of studies conducted at Ball State University bring common student needs together for a successful distance education experience. Timely interaction with the faculty is identified as a high value for the learning experience. For example, "student's satisfaction with the promptness of test/paper grading turnaround times was found to be strongly predictive of their telecourse performance." (Biner & Dean, 1995, p. 1). Robert Chase, President of the National Educational Association, stated that "distance learning can be quality learning only if colleges and universities recognize the needs of the student" (Carnevale, 2000a, p. 1) and that included agreement upon "expectations regarding times for student assignment completion and faculty response." (Institute for Higher Education Policy, 2000, p. 3). A more recent study found the student's locus of control had a direct bearing on their success and completion of coursework. "This study determined that a student's locus of control and source of financial assistance may act as predictors of their non-completion in distance education." (Parker, 1999, p. 6).

A greater number of institutions are offering courses in a web-based format; an estimated 10,000 courses are available according to the U.S. Department of Education's National Center for Educational Statistics (Acebo, Burrus & Kanter, 1998). The growing number of course offerings indicates that technology can "provide distance learning where the instructor and/or training source is some distance (a few hundred feet or 10,000 miles) from the learners." (Marquardt & Kearlsey, 1999, p. 62). "The web is well-suited to disseminating knowledge. It can deliver training on demand, while also easing administrative and logistical headaches." (Behan, 1999, p. 1). Specifically, institutions "everywhere are exploring ways to use technology to connect students more effectively with faculty, counselors, other students, and appropriate services and information resources." (Acebo, Burrus & Kanter, 1998, p. 14).

One recent study at California Polytechnic State University at San Luis Obispo found that interactive multimedia is allowing students to succeed in a key topic area. This study tracked 271 students who enrolled in a traditional, lecture-based, precalculus course. The study identified that students who had previously completed an online, or non-traditional, interactive course in intermediate algebra were more successful in the precalculus course than the students who had taken intermediate algebra in a classroom. "The students who took the nontraditional algebra course earned 49 percent more A's, B's, or C's [sic] in precalculus than did the students who completed the classroom algebra course." (Olsen, 2000, p. 1)

Another study came to the conclusion that "on-line students' performance was quite comparable to, and in some cases excelled, that of their classroom counterparts." (Ridley & Sammour, 1996, p. 338). Jerald Schutte, an instructor at California State University, Northridge, conducted an experimental study where nineteen students appeared in his Social Statistics traditional class and eighteen appeared in the same class taught via the web. "Contrary to the proposed hypotheses, quantitative results demonstrated the virtual class scored an average of 20% higher than the traditional class on both examinations." (Schutte, 1997, p. 1). This study included an attitude survey and discovered the web-based students felt they spent more time on classwork compared to their traditional counterparts yet "they were also more likely to think they had more flexibility, a greater understanding of the material, and a more positive affect toward math, in the end, than did the traditional class." (Schutte, 1997, p. 3).

Attrition Overview

There is a growing concern from faculty and administration regarding student success and dropout rates for distance students. Currently distance students have higher dropout rates than classroom students. Two identified consistent needs for web-based and telecourse students to achieve success include quick feedback to queries as well as tests and clear communication from the instructor. One

study of telecourse students reported that "course completion rates jumped from 69% to 91% when assignment turn-around time was decreased only 2.7 days, from 8.3 to 5.6 days." (Bink, et al., 1995, p. 18). Emilio Ramos teaches an introductory course about computers online through the Dallas County Community College District's R. Jan LeCroy Center for Educational Telecommunications. When he switched his online course to a web tool that integrated advanced communications and interactivity "his course completion rates jumped from 62 percent to 90 percent." (Carr, 2000, p. 5).

One study at a community college in North Carolina identified that "telecourse students were not a new population of students but were predominately a traditional group of students using telecourses to supplement their traditional college loads." (Willett, 1986, p. 35). This age group may not be as well suited to taking telecourses and this study identified age as a key statistic to determine if there is a correlation between success and distance technologies. Telecourse studies have identified high dropout rates compared to classroom rates for many years (Purdy, 1986; Searcy et al. 1993; Hammond, 1997). This rate may be "due to immature students who are unable to handle the greater autonomy of distance learners." (Easterday, 1997, p. 30).

A statistic the pilot study looked at was the age of the student. Various studies previously identified issues related to distance learning ranging from technology to communication as barriers. How these barriers and the age of the student affect course completion is an on-going concern. "Carr and Ledwith (1980) reported that student occupation, age and gender were related to dropout rates in distance education courses" (as cited in Bink, et al., 1995, p. 15) and technology adds additional variables to the distant student's learning experience. For example, technology issues may frustrate an older student who has not had extensive experience using computers and the Internet. The mature student "may appreciate the flexibility of an online course more than the typical undergraduate" (Ridley & Sammour, 1996, p. 339) and have a higher degree of self-discipline to stay on pace to complete assignments and not wait until the end of the term.

A recent study discovered negative experiences that included technical problems yet identified personal communication needs having a deeper, negative, impact to the student's learning experience. The student focus of this web-based program was a graduate course of study and the frustrations expressed were because "of a lack of immediate feedback from the instructor and ambiguous instructions on the web and via e-mail." (Hara & Kling, 1999, p. 18). In the study conducted at California State University, Northridge, students enrolled in the web-based class expressed frustration from their inability to ask the professor questions in a quick, real-time experience. This study found that the web-based students compensated for this interaction by creating "more involvement between and among peers, who formulated study groups to 'pick up the slack of not having a real classroom'." (Schutte, 1997, p. 3).

Interaction with the instructor, or the lack of it, is a common issue raised by web-based students. Dr. Tom Kubala, University of Central Florida, has been teaching several graduate level, web-based courses since the fall semester of 1996. Dr. Kubala (1998) reported positive statements made by students to him consistently include the individualized feedback, personal enjoyment of not traveling to campus and being able to be flexible in terms of time. Concerns raised include the loss of classmate interaction, a degree of discomfort in participating in an open forum online and technology support issues ranging from difficulties with the student's Internet Service Provider to unfamiliarity with the web-based system.

Section Summary

The ease of access from the student's perspective and the relative ease of production from the college's perspective make web-based distance education very appealing. This type of technology delivery system allows institutions of all sizes to compete equally in providing a quality product. The technology can allow the creation of a highly interactive program and the ability to allow the student an

active role in the learning process. The growth of the Internet and its acceptance into the home has spurred educational institutions to adopt these technologies "because they more quickly and easily increase an educator's capacity to help students make connections - particularly connections to content, context, and community - that result in more powerful learning experiences overall." (Milliron & Miles, 2000, p. 2).

Online instructors at Christopher Newport University "rated student performance and learning in the areas related to general skills development significantly higher in online than in classroom courses" (Ridley & Sammour, 1996, p. 338). Sheryl O'Neill, coordinator of entry-level mathematics and mathematics placement exams for California Polytechnic State University at San Luis Obispo, observed that the passing grade rate had increased and that the students were doing at least as well, and possibly even better, in their college-level courses (Olsen, 2000, p. 1). A study conducted at Christopher Newport University found that web-based course offerings impacted the institution's full time enrollment (FTE) confirming "that net FTE gain can accrue even when students overwhelmingly commute from inside the traditional service area." (Ridley et al., 1997, p. 16

Pilot Study Results

This study examined the effectiveness of using a telecourse and a web-based course to teach an Introduction to Statistics course at Lakeland Community College with a classroom equivalent. This study used the students who enrolled in the Math 155, Introduction to Statistics, course during the academic year 1999 - 2000 at Lakeland Community College and who completed the pre-test and final exam. Since it was the only content topic in this research, generalizations to other subject areas may be limited, even in similar conditions. The table below presents the analysis of the sample participation by delivery system and gender.

	TELECOURSE		WEB-BASED		LECTURE		
	A	**B**	**A**	**B**	**A**	**B**	**TOTALS**
Fall	**1**	**2**	**2**	**6**	**11**	**6**	**28**
	1F / 0M	0F / 2M	1F / 1M	3F / 3M	6F / 5M	4F / 2M	15F / 13M
Winter	**0**	**14**	**1**	**8**	**0**	**0**	**23**
		11F / 3M	1F / 0M	4F / 4M			16F / 7M
Spring	**0**	**7**	**2**	**8**	**4**	**6**	**27**
		5F / 2M	0F / 2M	7F / 1M	3F / 1M	2F / 4M	17F / 10M
TOTAL	**1**	**23**	**5**	**22**	**15**	**12**	**78**
	1F / 0M	16F / 7M	2F / 3M	14F / 8M	9F / 6M	6F / 6M	48F / 30M

***Legend*: A** = 21 with pre-test and final grade. **B** = 57 with pre-test, final grade and survey (73% of total number, n=78). **F** = female, **M** = male.

Of the students who completed the two tests 31, or 40%, were in the traditional age bracket (under the age of 22), and 47, or 60%, were in the non-traditional age bracket (22 and older). This age factor was different than other distance learning demographic research that had indicated that "the independent study population has shifted towards younger students" (Wallace, 1996, p. 1). It is interesting to note that in this sample group women were the larger of both age groups respectively as noted below. This data reflects similar results obtained in other studies (Wallace, 1996; Easterday, 1997).

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	Age Groups	Number	Total	Total	Percentages	Total
Male	Traditional	13			17%	
	Non-traditional	19			24%	
Total by Male			32			41%
Female	Traditional	18			23%	
	Non-traditional	28			36%	
Total by Female			46			59%
Total by Traditional				31		40%
Total by Non-traditional				47		60%
Totals			78	78		100%

Of this sample group of 78 students, 57 or 73% also completed an attitudinal survey. It is interesting to note that the online and telecourse students responded to the request to complete the attitudinal survey even though the survey was administered in a text format at the time of the final exam. It could be suggested that a reason for the higher response rate from the two distance student groups is related to their field independent style of learning that typically has a higher level of intrinsic value associated to the learning process (Shih & Gamon, 1999). Of the 27% who did not complete the survey, the lecture students were significantly higher in their lack of participation.

Five research questions and six null hypotheses were tested in this study. The questions are listed and addressed in order below.

Research Question 1

Will there be a significant difference in student achievement as measured by overall final course grade related to the instructional delivery method?

Null Hypothesis 1

There is no significant difference in student achievement as measured by overall final course grade between telecourse, web-based or lecture-based delivery method. The results indicated no significant difference in the final course grade comparison between the instructional delivery methods composed of classroom delivery, telecourse and web-based delivery systems. This research indicates that there is also no harm to the learner, as measured in final course grade, by institutions using alternative instructional delivery systems. The feedback obtained in the attitudinal survey suggests that alternative delivery systems such as telecourses and web-based instruction may work to the student's advantage in terms of time and access gained. Technology offers the student the ability to shift time and increase access to instructional materials compared to traditional lecture-based delivery.

Research Question 2

Is student achievement, as measured by final grade, impacted by the age and gender, of the traditional student compared to the age and gender of the non-traditional student regardless of delivery method?

Null Hypothesis 2, 3, 4

- There is no significant difference in student achievement, as measured by final grade, between traditional (under the age of 22) and non-traditional age (22 and older) student between telecourse, web-based or lecture delivery method.
- There is no significant difference in student achievement, as measured by final grade and gender, between telecourse, web-based or lecture delivery method.

- There is no significant difference in student achievement, as measured by final grade and gender, between traditional and non-traditional student between telecourse, web-based or lecture delivery method.

There was no significant difference in the interaction of the delivery methods with the pre-test used as a covariate on the final course grade with traditional and non-traditional age students. The results showed no significant difference among the three instructional delivery methods on the overall final course grade (dependent variable) when comparing traditional age students to non-traditional age students. The results also indicated no significant statistical difference in student achievement with regard to gender. Therefore, it can be concluded that for this research project there is no significant statistical difference in student achievement, as measured by overall final course grade, using the three different instructional delivery systems when comparing traditional and non-traditional age students regardless of gender.

It was interesting to observe that, overall women of all ages had higher final course grades in the different sections and delivery systems. The one exception was in web-based where non-traditional men had a higher final course grade. This result was different than other studies that had identified women as being more successful (Institute for Higher Education, 1999). One possible explanation for this difference could be that distance learners are typically more field-independent in their learning style (Miller, 1997). Field-independent learners, such as the non-traditional age males noted above, "tend to approach a problem more analytically, rely on self-structured situations, prefer competition, and are intrinsically motivated." (Shih & Gamon, 1999, p. 2). Another study conducted by the U.S. Navy supports the research indicating that "females are more likely to be field-dependent learners" (Golas, Bartoli, Miller, & Idar, 1999, p. 8). This Navy study also discovered that males had scored slightly higher than females on a final exam but not statistically different. Other studies had also identified traditional age students having a higher level of technological knowledge which was related to higher grades compared to students who have not had as much web and computer experience (Broad, 1999). This research indicated otherwise which is encouraging for community colleges that are looking at offering web-based courses and whose typical student is a non-traditional age student.

Research Question 3

Does student satisfaction, as measured by attitudes towards the chosen delivery method, impact the final grade?

Null Hypothesis 5

There is no significant difference in student achievement, as measured by attitudes, between telecourse, web-based or lecture delivery method. Specifically, particular sections in the survey were averaged and then compared to the student's final grade. The student was unaware of their final grade at the time the survey was being filled out. Overall the combined sections indicated that there was no significant statistical difference in student achievement as measured by attitudes between the instructional delivery systems.

Section 2 in the attitudinal survey asked the students to identify their perception of their level of technological sophistication, which was then compared to the final course grade. In this analysis, there was a significant difference in student achievement as measured by this section's response in terms of delivery system and final course grade. Not surprisingly, responses in this section regarding personal level of technology were higher from web-based students compared to lecture-based students. One area of interest in this section involved the perception of skills when compared to the final grade. Students who earned an "A" did not think they were as technically savvy as students who earned a "B" or a "D". Students who earned a "D" scored themselves the highest in this section concerned with perception about technology skill. It could be suggested that "A" students feel they must work harder and therefore are not as confident of their individual technical skills.

Section 3 in the attitudinal survey asked the students to evaluate the course in terms of mode of delivery and presentation concerns. This was then compared to the final course grade. Further analysis identified no significant difference noted between the type of delivery systems, the final course grade and the comparison of delivery systems and course grade within this section. It was interesting to note this result, since other studies (Brey & Grigsby, 1984; McNabb, 1994) had indicated the telecourse mode of delivery would see favorable responses to questions ranging from reliability, clear objectives, and expected outcomes. The results could indicate that the web-based section, when written clearly, has the same favorable perception to a student as telecourses have had in the past.

Section 4 in the attitudinal survey asked the students to identify their perception of the resources available to them ranging from library resources to student services. There was a significant difference in the overall final course grade. It is interesting to note that students with final course grade of "F" felt that they had a greater access to resources than students with a final course grade of "D" or those with a "B". Further investigation would be indicated here to obtain detailed reasons for this response. This section also identified that the traditional classroom student felt very strongly that they had more availability to resources for learning compared to telecourse students but only slightly more than web-based students.

Included in this section was the question whether a student would recommend or consider taking another course using the same type of instructional delivery system. Of the students who responded the overall result was 84% (n=46) who responded favorably. Specific responses from all three instructional delivery systems included students enrolled in the lecture sections 70% (n=7/10) of whom answered favorably, 83% (n=19/23) of the telecourse students responded favorably and 91% (n=20/22) of the web-based students answering favorably. The lack of social integration might have been a factor for a less than favorable response as suggested by Pugliese (1994); however, with the responses obtained in this research it, can be surmised that the options of time, travel, and self-paced learning suggested by Ridley, Bailey, et.al (1997) and Wallace (1996) among others were viewed very positively by the students.

Research Question 4

Will students feel that time and travel options provided by telecourse or web-based delivery systems impact and/or enhance their final grades compared to the lecture delivery method?

Null Hypothesis 6

There is no significant difference in telecourse or web-based student attitudes that time and travel options enhanced their final grade compared to lecture based student attitudes.

Overall, this analysis indicated no significant relationship between the final grades and the time and travel options offered to students at a distance compared to lecture based students. Detailed analysis determined that there was no significant relationship between the final course grade and a specific reason for taking this college course via a specific instructional delivery system.

There was a value of significance between the hours spent on campus and the final grade. While the data might suggest that the more hours spent on campus will lead to a higher grade, this number is questionable, however due to the small sample sizes in the groups. In the groups who spent five, six and seven hours a week on campus the sample size groups were only two, six and four respectively. This is an area that should be further researched to confirm significance. It was interesting to note that approximately 18% of the respondents indicated that they worked 40 or more hours a week. Further, 30% indicated that they worked between 31 and 40 hours a week with the remainder, 52%, worked under 30 hours a week. This is in line with other studies that indicate that the community college student works part-time (Smith, 1993; Roberts, 1996; Langenberg, 1999). This part-time student cohort data would support institutional efforts to provide additional instructional programs that allow the ability to shift time by providing increased flexibility of schedule over lecture systems such as telecourse and web-based.

Likewise, there was no significant relationship between the distance a student had to travel to campus and their final grade. While the sample was small it is interesting to note that approximately 26% lived within five miles from campus, 57% lived between six and 20 miles and 16% lived between 21 and 50 miles away. This result follows other studies where students choosing non-lecture options were within the traditional service area of the host institution (Ridley, et.al., 1997). It is also of interest that of the students who responded to the survey (n=57), 21% were enrolled in the lecture, 40% enrolled in the telecourse and 37% enrolled in the web-based section. Enrollment in the traditional lecture sections did not appear to be impacted with a drop in enrollment according to Sharon Blankenship, interim Director of Research, at Lakeland Community College (Personal communication, September 22, 2000). It would appear that offering other methods of instructional delivery supported other research that suggested enrollment gains as opposed to enrollment redistribution (Ridley, et. al., 1997).

Research Question 5

Will students feel that physical, mental, environmental, and technical obstacles within their chosen learning environment impacted and/or enhanced their learning experience in terms of performance?

Null Hypothesis 7

There is no significant difference in student attitudes that physical, mental, environmental, and technical obstacles enhanced their learning experience in terms of their final grade.

Of the 57 students who completed the survey only two indicated that they had a disability. This low sample size (n=2) has a questionable value although it is interesting to note that each student chose a different delivery system. The traditional age female chose the lecture method while the non-traditional age male chose the web-based course. The use of the web-based delivery system could be proposed as a logical solution for a student with a learning disability by providing an instructional experience that is individualized and provides the advantages computer-based technology systems have (Newby, Stepich, Lehman & Russell, 1996). The potential advantages technology may bring to a student must be evaluated carefully against the social learning need a student may require (Ormrod, 1990).

Pilot Year Conclusions

Overall, the conclusion that can be drawn from the results indicate that there is no significant statistical difference, as measured by the final grade, between the classroom, telecourse and web-based instructional delivery systems used in this research project. In summary the key points include:

- Students did as well in the course of instruction regardless of delivery system.
- The age and the gender of the student did not impact the final grade regardless of delivery system.
- Student satisfaction, or lack of, does not impact the final grade regardless of the delivery system.
- Time and travel options do not impact the final grade regardless of the delivery system.
- Obstacles including physical, mental, environmental and technical concerns do not impact the learning experience in terms of their final grade regardless of the delivery system.

Year 2 Results

Following the pilot study it was determined to analyze the overall distance offerings and compare them to the traditional, classroom, counterpart. Given the workload identified during the pilot year it was determined to compare overall GPA's per class and to track the attrition rates. Attrition was defined in the following manner: Attrition rate = [(14-day enroll.) - (End of term enroll.)] / 14-day enroll.

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During the academic year the overall GPA was compared. It was discovered that in 21 of 28 cases, average GPAs were lower for telecourses than traditional classroom equivalents (2.35 to 2.51). The full-year data reinforced the tentative conclusion that the average student GPA tended to be lower for telecourses than for their traditional course equivalent.

Summer 2000	5 out of 5 = lower for telecourses
Fall 2000	8 out of 12 = lower for telecourses
Spring 2001	8 out of 11 = lower for telecourses

The overall average GPAs were higher for online than for traditional classroom equivalents (2.81 to 2.51). However, in 11 of 17 cases, the individual class GPAs were lower for online than traditional classroom equivalents.

Summer 2000	2 out of 2 = higher for traditional
Fall 2000	4 out of 6 = higher for traditional
Spring 2001	5 out of 9 = higher for traditional

The full-year data raise the question if the enrollment and higher attrition for online affected individual grades. A hypothesis might be that the remaining online students scored higher than the overall traditional student. The sample size (373 online to over 7,000 traditional) raises several questions for further analysis. It is interesting to note that the evidence is not strong enough to do much more than flag this as an issue worth watching.

Special attention was devoted to attrition. In 22 of 28 cases, average attrition rates were higher for telecourses than traditional equivalents (13.7 to 7.3). The full-year data suggests that the attrition rates may be higher for telecourses than for their traditional course equivalents. Because the enrollment numbers for the telecourses are small, the attrition rates may be artificially inflated. Consequently, these observations should be interpreted as preliminary. An interesting note is that attrition patterns during Fall 2000 semester were very different (lower) than Spring and Summer terms. During the Fall, in 4 cases, the attrition rate was higher for the traditional course; in 2 cases, the attrition rates were equal. The reason for this is unclear.

Summer 2000	5 out of 5 = higher for telecourses
Fall 2000	6 out of 12 = higher for telecourses
Spring 2001	11 out of 11 = higher for telecourses

However, no clear pattern emerged regarding attrition rates for traditional versus online courses (7.3% to 11.8%). The full-year data indicated no significant difference and no clear pattern exists with regard to attrition rates for traditional vs. online courses.

Summer 2000	2 out of 2 = the same
Fall 2000	4 out of 6 = higher for online
Spring 2001	4 out of 9 = higher for online

In preliminary analysis a working hypothesis is that high attrition rate in DL classes affects overall attrition rate. However the results reflect that the overall impact is too small to be of significance. Although the attrition rate is high for some DL courses, others saw increased enrollment after the 14-day period (due to student add backs). Another factor identified that the attrition is higher in semesters (almost double) than in quarters.

Some basic facts regarding attrition were identified during this analysis:

- Ratio of DL classes to traditional
- High attrition rate for some DL courses but not others
- Some DL classes saw increased enrollment
- Higher in semesters than in quarters

One final note regarding the second year's findings. A question was raised by the institution whether the attrition rate would drop if the distance learning courses were excluded from the overall attrition analysis. It was discovered that the answer was yes but not considered a value of significance. For example Fall 2001 attrition was 8.32%. Pulling out the DL classes Fall 2001 attrition rate was 8.19%. This is typical of the other semester findings according to Dr. Eileen Doherty, Director of Research at Lakeland Community College. This data comes with areas of question. One factor is the relatively small number of distance course offerings available during the academic year 2000 - 2001 (136 courses) compared to the annual traditional offerings (over 6,000).

Conclusion

Questions remain as to whether technology-based delivery systems are effective and whether they can meet the expectation that institutions, and students, are placing on these systems, especially web-based. Terry O'Banion, President Emeritus of the League for Innovation, recently stated that "while there is great potential, Internet-based learning also holds the promise of making already terrible instruction that much more available." (Milliron & Miles, 2000, p. 2).

This research is taking place at a community college that has met the needs of the traditional as well as non-traditional student using classical, classroom-based, teaching methods. As the older student cohort begins to impact student enrollment (Langenberg, 1999), these institutions are facing challenges in meeting the needs of these students in terms of facilities and faculty resources. Learning increases when "there is more interaction and faster feedback between students and their professors, between parents and their children; students (and siblings) help each other learn (collaborative learning), students are provided the same material in multiple formats." (Brown, 2000, p. 22). Institutions have identified distance education as an alternative means of access to instruction and are working to create programs that meet the needs of this non-traditional student. "The learning process must incorporate practical application of the subject matter and be problem-centered. Finally, facilitation, as opposed to the lecture approach, is much more likely to be successful for the older student." (Ellis, 2000, p. 14). The data collected from this study can be used by other institutions facing the challenge of delivering instruction to a community of distance learners.

"Distance education represents the convergence of a host of issues for higher education." (Oblinger & Kidwell, 2000, p. 31). This study will contribute to the field of distance education in terms of the issues institutions face as they alter their traditional approach to delivering instruction in order to reach new markets and compete against new educational providers. There is a tendency to define distance education as a technology issue and in terms of hardware costs it needs to be evaluated as such. This study brings additional data on the impact and effectiveness that two technology-based delivery systems have on student success. The results can be reviewed and analyzed against the benchmark of lecture-based instruction in order to obtain and implement the most effective delivery system for a student-centered institution.

The results of this research indicate several differences in the successful student, specifically supporting past studies that indicate the successful distance student is a non-traditional age female living within sixty miles of the institution and working part-time. This research also showed that non-traditional males were successful using web-based instruction and computer technology. These differences impact how distance courses are designed and marketed. This data impacts how an institution targets students and how it creates a strategic recruiting plan to increase enrollment. Expanding services that support working students could impact enrollment positively. For example, offering library and bookstore alternative time and location options to access these resources away from campus, and even on-campus, might reduce barriers to the student. An additional example, specific to the non-traditional parent, who works part-time, might be childcare provided on campus. Targeted career counseling options offered remotely might include job search and interviewing skills. Data collected from the attitudinal survey offered insight into

new access considerations. Several written responses indicated that students wanted additional training on using web-based tools, especially library and on-line reference tools, in order to access the instruction. This response may result in a unique course offered on the host campus or specially designed for web-based browser access.

Recommendations for Future Research

One recommendation for additional research would be to increase the population size by comparing instructional delivery systems at institutions that have larger class sizes. Other studies may want to evaluate the teaching and learning process as determined by class size. A recent University of Illinois study indicated a concern that the number of students being taught online "at the same level of quality as in the classroom requires more time, or equivalently, in the same amount of time fewer students can be taught online than in the classroom if high quality teaching is to occur." (University of Illinois, 1999, p. 49). An expansion on this recommendation would be to conduct research that focused on and compared the effectiveness of an entire academic program that was delivered traditionally and at a distance.

In addition to expanding the population size, a further recommendation would be to analyze the student age in greater detail. For the purposes of this study, 22 years old was the line defining traditional and non-traditional age students. Recent research by de los Santos Jr. identified that the community college population included students in age groups that contained "60 percent were older than 22 years of age; 15 percent were 40 years old or older" (2001, p. 28). A recommendation for future research would suggest expanding the age separation to include traditional and several mid-range age groups in order to explore this older student cohort in greater detail.

Another new research study could focus on how instructional tools and design methodologies can be used to create a learning environment that maximizes student interaction. Jules LaPidus, head of the Council for Graduate Schools, stated, in a speech given at Claremeont Graduate University, that discussion regarding "the uses of information technology in teaching and learning appears to be focused on its use as a delivery system for content rather than on how it will alter and improve the ability of people to learn" (as cited by Munitz, 2000, p. 15). Communication tools and interactive collaboration exercises have been touted as a part of the emerging technology benefits, but there is little data to support whether these tools help or hinder the learning ability of the distance student.

The results identified in the data will benefit institutions by supporting their efforts to provide self-assessment exercises and learning style inventory testing in order to increase student persistence (Fjortoft, 1996) and to prepare students for successful distance learning experiences. This research could have been enhanced and made more meaningful if options such as the learning inventory were administered to the student population. While there continues to be discussion regarding whether or not the use of technology to deliver instruction is effective, this research stresses the need to focus further studies on the altering, or transformative, power delivery systems may bring to people to access new instructional opportunities. This type of research would further increase the ability to improve the learning experience rather than just realize efficiencies contained in the process and would benefit institutions that strive for a "high level of consistency in course development, design and delivery." (Twigg, 2001, p. 22).

During the course of this research, there were many opportunities to exchange ideas with colleagues within the academic community and several topics for additional research were identified and listed below:

- How does time spent on campus and grades compare to time spent online and the grade?
- How much interaction and response time between instructor and student is needed to impact dropout rates among distance students?
- What is the dropout rates for an entire institution, comparing classroom to distance offerings?

- One volatile area involves research into instructor skills and how they are teaching distance students.

Different delivery systems often require different presentation and communication skills in order to be effective as noted in videoconferencing systems (Brown, 1988) and web-based systems (University of Illinois, 1999). Research into presentation and communication styles is warranted and should be combined with the relation of the response time between faculty and student interaction to ensure effective student learning occurs.

Summary

"Distance education represents the convergence of a host of issues for higher education."(Oblinger & Kidwell, 2000, p. 31). The academic institution has delivered instruction to students at a distance for hundreds of years beginning with print-based correspondence courses to video-based telecourses and now to the rapidly evolving Internet and web-based courses. One question raised by faculty, students and administrators centers around the quality of education delivered in web-based courses. The National Education Association president, Bob Chase, stated that the "public debate over the merits of Internet-based distance learning has too often consisted of high-pitched vitriol and hyperbole." (National Education Association, 2000, p. 1). This research provides additional data to the educational community to show that student performance was not impacted by their choice of a telecourse or a web-based section. Grades were not significantly different either when compared to grades earned by students in the traditional lecture class.

Institutions with an active telecourse program can see from the data collected that student success and attitudes are still current and not significantly different from their classroom counterparts. The data from this research indicates that issues, such as flexibility of schedule and reduced travel, that motivated students in the past to choose this delivery system (Easterday, 1997) are still valid today. Expanding services to students, such as making tape sets available or adding another communication tool, such as a web-based component to the telecourse, may enhance the learning experience (Hammond, 1997).

The same can be said for web-based students as well. Of particular interest is that "communication between faculty and students is more frequent and timely, more collaboration occurs among students, students have access to a broader range of materials and people, computers enable more interaction, collaboration, and customization, and consequently, better learning." (Brown, 2000, p. 22). With the rapid growth of the web, this delivery option may be an attractive choice to an institution that is looking at expanding its course and program offerings.

An outcome of this research is the exploration of the changing role of the instructor at the host institution. Literature review and conversations with the faculty identified that delivering instruction via telecourse or web-based involved adding new activities for interaction with the student. Faculty involved in this research identified the need for an increased focus on the student. Specific topics related to communication issues were identified as worthy of further exploration. The instructor who chooses to create and deliver instruction using a technology-based system must become the designer "of the learning environment, constantly assessing and seeking improvements. They will continue to guide, mentor and evaluate the learning of their students." (Boggs, 1999, p. 3). This research identified that the delivery systems do not significantly impact learning; however, research has identified that interactivity, communication and timeliness are vital in successful student completion of distance courses (Biner & Dean, 1995; Bink,et. al., 1995).

The conclusion that can be drawn from the results identified from this study indicate that there is no significant statistical difference, as measured by the final grade, between the classroom, telecourse and web-based instructional delivery systems. Other research (Institute for Higher Education Policy, 2000) is suggesting that the design of the instruction, and not the delivery system, should be more closely

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examined especially web-based programs that need to tightly integrate content and the development of instructional materials. Technology-based delivery systems may offer the same opportunities to focus on skills that are based on defined learning outcomes; however, the need of the student's learning style should be considered and this may lead to blended course offerings integrating mixed instructional delivery systems. This can be accomplished by utilizing the technology-based tools to increase the student's "ability to gain access to information, to interpret it, to give it context, to use information to solve problems, and to collaborate with others in problem-solving." (Doucette, 1994, p. 23). While technology-based solutions bring new sources of information to the learning experience, the classroom still provides unique, interactive solutions to learning. The classroom needs to change to integrate technology options and information access to students involved in "group interactions, business problem solving, performance evaluation, expert observation, culture building, and teamwork" (Rosenberg, 2001, p. 120) experiences that are vital components of the learning experience. It may be said "what is emerging most clearly from the technological explosion is, ironically enough, a refocusing on people." (Winer, Rushby & Vazquez-Abad, 1999, p. 891).

The data from this research supports this increased attention on the student and on the design considerations of content that will utilize technology-based delivery systems such as telecourses and web-based courses. Since the instructional delivery systems do not impact the learner then institutions can focus on continued evaluation and assessment of the options technology-based systems bring to the learning experience in terms of access to instruction, time and distance flexibility, and increased communication between student and instructor. "It is imperative to begin building and implementing models of change that will be comprehensive, systematic, and successful in order to prepare students for the world of tomorrow." (Robinson, 2000, p. 65).

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